



Slideshow

FULL DETAILS AND TRANSCRIPT

Using Project-Based Learning

Hillcrest High School, Texas • November 2007

Topic: Encouraging Girls in Math and Science

Practice: Sparking Curiosity

Highlights

- Hands-on activities are a good way to help students connect with science.
- Students plan their experiments and analyze the data collected.
- Students rotate roles within groups to make sure every student has performed all roles of scientific experiments including manipulating the equipment, running the computer software, and working on mathematical calculations.
- Creating an environment in which girls and boys have an equal opportunity to succeed is a crucial part of classroom management—one strategy is to seat girls separately, so that boys do not take over group activities.
- When students actively collaborate with each other, they come away with a stronger grasp of the material.

About the Site

Hillcrest High School
Dallas, TX

Demographics

53% Hispanic, 29% Black

59% Low-SES

33% Limited English Proficient

52% Females

Hillcrest High School, an urban school that serves primarily ethnic minority population, has been recognized for its efforts to promote students' enrollment in Advanced Placement (AP) courses. For example, this school ranked in the top 5% of high schools in the country, according to Time Magazine, for AP exams proctored. They encourage girls by:

- Active recruitment of girls to AP classes
- AP physics teacher trained by the Center for Gender Equity
- Technology grants pursued to enrich school labs
- Encouragement of hands-on scientific inquiry in the classroom

Full Transcript

Presentation Title: Engaging Students with Project-Based Learning, Hillcrest High School

Through a combination of project-based learning, relevant examples, and classroom management, physics teacher Daniel Brown from Hillcrest High School, creates a learning environment that engages boys and girls equally.

Slide #1: Introductory Lessons

A powerful way to get the attention of students is to emphasize how scientific laws and principles apply in the “real world.” The students in this class learn about formulas relevant to the law of momentum conservation. Their teacher, Mr. Brown, explains how this law is used in dealing with everyday events, such as investigations of car accidents.

Slide #2: Hands-On Learning

Access to the proper physical tools helps students engage with the material. These students are using motion sensors, tracks, carts, weights, and a computer to test the law of momentum conservation. Specifically, they are measuring the speeds of two carts before and after they collide with each other. The computer receives the signal from the motion sensors, which are at either end of the track, and plots the data.

Slide #3: Variations In Experimental Conditions

Students are encouraged to vary the conditions of the experiment, and think about different ways they would like to explore their hypotheses. For example, the students can push a cart towards another cart that is at rest. They measure the velocity of both carts after collision.

Slide #4: Girls Sit Together

Creating an environment in which girls and boys have an equal opportunity to succeed is a crucial part of classroom management. In Mr. Brown's class, girls sit at a separate table for the first few months in order to ensure that boys don't take over their equipment or calculations. This gives them time and space in which to build confidence in their ability to carry out all aspects of an experiment.

Slide #5: Rotating Roles

Give students a chance to develop all the skills needed in a successful experiment. These students often work in small, structured groups with each person taking on a specific role. In this experiment, one student sets the carts on the tracks, another works with the computer, and another takes notes that will be used for calculations. On a regular basis, they rotate these duties so that each of them gets a chance to practice each role's responsibilities.

Slide #6: Collaborative Problem Solving

By helping each other solve problems and understand calculations, students may get a much stronger grasp on the material. As they work with each other, they have ample opportunity to explain their thinking about physics in their own words. This allows them to clarify their own thinking as well as learn new problem-solving techniques from each other.

Slide #7: Examining the Data

Once they have the data, the students continue to work together to analyze their findings. They compare their results to their initial expectations and revise their understandings of the principles being tested.

Slide #8: Summary of the Lab Experience

Once they have understood how the lesson applies to life, worked together in a variety of roles to experiment with the material, and extensively discussed their thinking about it, the students are much more invested in their learning. As Mr. Brown summarizes the day's lesson, his students show a solid grasp of the scientific vocabulary, formulas, and reasoning of the experiment.